In chapter 6, Extended Marshall-Olkin bivariate exponential distribution is introduced and its properties are studied. Expressions for stress- strength reliability are obtained. Estimation of parameters is done. Multivariate extensions as well as computation of R for various parameter combinations are also done. We introduce three different forms of minification processes and necessary and sufficient conditions for stationarity are established.

In chapter 7, Marshall-Olkin Gumbel bivariate exponential distribution is introduced and its properties are studied. Expressions for stress- strength reliability $R = P(X < Y)$ of a two component system is derived, where stress (X) and strength (Y) are independently distributed and stress (X) consists of two components namely X_1 and X_2. Components of stress are assumed to be in series or in parallel. The reliability of the system when the components X_1 and X_2 have Morgenstern Gumbel bivariate and Marshall-Olkin Gumbel bivariate exponential distributions are derived and evaluated for various parameter values. Two different minification processes with Marshall -Olkin Gumbel bivariate exponential marginal distribution are also developed and studied.The reliability values are also computed for different parameter values. Expression for the bivariate failure rate is also derived. Using these, bivariate system reliability can be estimated and also multi-component systems having optimum reliability properties can be designed.

In chapter 8 a new bivariate distribution called Marshall-Olkin Morgenstern bivariate Weibull distribution is introduced and studied. Two different models of minification processes with the above bivariate distribution as stationary marginal distribution are developed. It is shown that the process is strictly stationary. The properties of the process are derived. The expressions for reliability under stress-strength analysis when the components are in series and parallel are obtained. The process is extended to p^{th} order as well as k-variate cases.

Thus the thesis deals with a number of univariate and bivariate distributions and their applications in autoregressive time series modeling through minification processes stochastic processes, reliability theory, stress-strength analysis, acceptance sampling etc.

The following research papers have been published/ presented in conferences/ communicated for publication.

Presentations

1. Presented a paper titled “Marshall-Olkin Gumbel Bivariate Minification Processes and their Applications” in the International Conference on Mathematical Sciences, at St.Thomas College Pala, Kottayam, during January 3-5, 2011.

2. Presented a paper titled “Marshall-Olkin Morgenstern Weibull distribution: Generalizations and Applications” in the International Conference on Actuarial Statistics, Bio Statistics and Stochastic Modeling at Kannur University, during January 10-14, 2011.

3. Presented a paper titled “Marshall-Olkin Gumbel Bivariate Distribution and its Applications in Stress Strength Analysis” in the National Seminar on Discrete Mathematics and Computational Statistics at Bishop Kurialacherry College For Women Amalagiri, Kottayam, during June 23-24, 2011.

4. Presented a paper titled “Autoregressive Minification Processes with Marshall-Olkin Gumbel Marginal Distributions and Applications” in the International Conference on Statistics and Information Analytics at Loyola College Chennai, during August 25-27, 2011.

5. Accepted for presentation the paper titled “Generalizations of Gumbel distributions and their Applications” in the 31^{th} annual Conference of Indian Society for Probability and Statistics (ISPS)

and International Conference on Statistics, Probability and Related Areas., at Cochin University of Science and Technology, during December 19-22, 2011.

Publications

1. Jose, K. K., Rani Sebastian (2010), Marshall -Olkin Gumbel bivariate distributions and their applications in stress-strength reliability analysis and autoregressive minification processes, *Journal of Statistics and Applications*, 5 (219-239)

2. Jose, K. K., Rani Sebastian (2011), Marshall-Olkin Gumbel Bivariate Distribution and its Applications in Stress Strength Analysis, *Proceedings of the National Seminar on Discrete Mathematics and Computational Statistics.*

3. Jose, K. K., Rani Sebastian (2011), Marshall -Olkin Morgenstern Weibull distribution : Generalisations and applications, *Economic Quality Control*(submitted).

4. Jose, K. K., Rani Sebastian (2011), Reliability Test Plans for Marshall-Olkin Gumbel Maximum distribution, *Journal of Applied Statistical Sciences* (submitted).

5. Jose, K. K., Rani Sebastian, Ancy Joseph (2011),Marshall-Olkin Gumbel distribution and Applications, *Journal of Environmental Statistics* (submitted).

6. Jose, K. K., Rani Sebastian, Ancy Joseph (2011) Gumbel distribution: Generalizations and Applications, *Journal of Probability and Statistical Science*(submitted).

7. Rani Sebastian, Jose, K. K., Ancy Joseph (2011) Extended Marshall-Olkin Bivariate Exponential Distributions and Minification Processes,*Communications in Statistics: Theory and Methods* (submitted)

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